Hazards Forum

Designing for Risk Reduction in Construction, Operation and Maintenance

8 December 2005

Sponsored by: and

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Health & Safety Executive
Designing for Risk Reduction in Construction, Operation and Maintenance

Date: Thursday 8th December, 2005
Location: Institution of Mechanical Engineers, One Birdcage Walk, London, SW1H 9JJ.

Event Programme

17.30 -18.00 Tea and assemble
18.00 Welcome and Introduction
   Gordon Masterton, President, Institution of Civil Engineers
18.10 Presentations
   Pam Waldron, HSE, Head of Operations, Yorkshire and NE
   David Greenhalgh, Director, Osprey Mott MacDonald,
   Project Manager, Portsmouth Spinnaker Tower
   Colin Smith, Director Safety, Quality and Environment
   Balfour Beatty Construction Limited.
19.10 Discussion Period
20.00 Concluding remarks
   Gordon Masterton
20.10 - 21.00 Wine and light refreshments

Background

The built environment is with us for a long time and makes a big impact on our daily lives, whether it is public infrastructure such as roads, bridges, railways, hospitals, schools, recreation centres, or private development of industrial sites, shopping malls, office complexes or housing.

Any new development represents a significant investment of money, time and energy – and represents an opportunity to create a new asset that meets the needs of many stakeholders: the client, end users, funders, the construction team, operators and maintainers, the local community - and the environment.

With hindsight, it is often too easy to see how the development could have been improved from one of these perspectives – made safer to build, or easier and safer to operate and maintain, or even more pleasant and safer to use.

The meeting will explore the role of designers in achieving all this, and will explore, amongst other things, questions such as:

- How can design improve buildability and safety in construction?
- Can prefabrication and off-site construction methods be used to improve quality, cost, time and safety?
- Can hazards be designed out, e.g. reducing the need to work at height?
- Can new methods and materials reduce the need for manual handling and on-going maintenance?
- Can hospitals be designed to support infection control?
- What does the law require of designers?
- What are the benefits of early contractor involvement?
- How to address local community and environmental issues?
- How to reconcile creative and innovative design with health, safety and environmental demands?
Designing for Risk Reduction in Construction, Operation and Maintenance

Thursday 8th December 2005
The Institution of Mechanical Engineers

ATTENDANCE LIST

CHAIRMAN
Mr Gordon Masterton, President, Institution of Civil Engineers

SPEAKERS
Ms Pam Waldron, HSE, Head of Operations, Yorkshire and NE
Mr David Greenhalgh, Director, Osprey Mott MacDonald
Mr Colin Smith, Director for Safety, Health, Env. and Quality, Balfour Beatty Construction

GUESTS

Mr Eric Arnold, Cabinet Office
Dr Tony Bandle, Health & Safety Executive
Mr Michael Barrett, British Waterways
Mr Chris Bolton, Institution of Structural engineers
Dr John Bond, Individual Member
Mrs Pat Bond, Guest
Ms Sally Brearley, Balfour Beatty plc
Sir David Davies, Chairman, Hazards Forum
Mr Richard Eiser, Centre for Research in Social Studies
Mr Bob Foster, Individual Member
Dr Dougal Goodman, Foundation for Science and Technology
Dr Frank Grossman, Guest
Mr Ian Jones, DSC
Mr Miles Jordon, Environment Agency
Mr Tim Kind, Guest
Dr Ian Lawrenson, Hazards Forum Newsletter Editor
Mr John Lee, Hazard Forum
Mr Peter Livock, Individual Member
Mr Duncan Michael, Guest
Dr Robert Muir-Wood, Risk Management Solutions Ltd
Mr Anthony Pickett, Lloyd’s Register
Mr Stephen Piekos, Eurogears Ltd
Mr Jon Pritchard, Institution of Civil Engineers
Mr Brian Rofe, Individual Member
Mr Mike Ryland, Institution of Structural Engineers
Mr Reg Sell, Ergonomics Society
Mr Brian Thompson, Individual Member
Professor John Uff QC, Executive Member
Event Report

Introduction

The Chairman, Mr Gordon Masterton, welcomed 31 guests to the Institution of Mechanical Engineers for the final Hazards Forum event in 2005. He said he was looking forward to the evening not least because in the Construction Industry there had been 45 deaths so far and this was far too many. He mentioned the Ken Livingstone talk that he had attended that afternoon addressing safety issues in the construction of the Olympic 2012 developments, how appropriate therefore that the Hazards Forum were looking at that very subject this evening. He then thanked The Health and Safety Executive and the Institution of Mechanical Engineers for sponsoring the event before introducing each of the evening’s speakers finally inviting Pam Waldron to make the first presentation.

DESIGNING FOR RISK REDUCTION

Pam Waldron, HSE, Head of Operations, Yorkshire and NE

Those who attended had the benefit of Pam Waldron talking through some interesting slides of good and bad practice – the text slides are reproduced below.

Mrs Waldron opened by explaining that both HSE and the construction industry itself have been trying hard to improve standards over a number of years and that unfortunately the things which kill, injure and make people ill remain broadly the same. ‘Why is it still so unsafe?’ One major area where significant improvements could be made is in the elimination and reduction of risk at the design stage. Designers are in a unique position, she said, to influence and reduce the risks that arise during construction, as illustrated, but also during use, maintenance, refurbishment and eventually demolition. Decisions taken by designers fundamentally affect the risks faced by workers and those that use the building. An amusing but telling illustration was shown where a crane had to be used to change a high level light bulb when better design could have made it easier and cheaper. The experience of HSE inspectors is that some designers still show little interest in or understanding of the health and safety implications of construction in their designs. It works best (unsurprisingly) where health and safety is an integral part of the design process, not an afterthought. Mentioning the Construction Design and Management Regulations she immediately rejected the myth that these had stifled design by taking away from designers the ability to be creative, limiting their design freedom or forcing them to place safety above aesthetics. This was just not true. Nor do they need to have a detailed knowledge of construction processes or specify standard construction processes or precautionary measures to the contractors. They do not have to take into account unforeseeable hazards or exercise any health and safety management functions over contractors or other designers. Their primary responsibility is to minimise hazards and risks to people by good design. Initially they should try to eliminate hazards. If hazards cannot be eliminated then risks should be minimised and designers should provide information on any significant residual risk. This should be managed through structured hazard identification throughout the building’s life cycle.

In construction there are seven priority areas on which a designer can concentrate and effect a real improvement in safety. First is working at height, an inevitable hazard not only during construction but during maintenance as well. A picture of a building containing
several flats was shown. The roof design was complex, and in some places flat, leading to many instances of rain leaking into the building and access was necessary onto the roof. Perversely this access had been provided above the stairwell providing the opportunity to fall the greatest distance! Ways in which risks from working at height can be eliminated or reduced include fabrication at ground level or even factory prefabrication may be possible. This could even include the installation of services such as electric cabling, switches and lighting before the whole fabricated assembly is lifted into position. On a similar theme, if edge protection has to be provided then design the steelwork for early edge protection and also for net attachment. When nets were first provided it caused laughter and some derision, nowadays however nets are used extensively and have improved the working environment in a number of ways. Another design target should be to provide the permanent means of access to the structure early on in the construction process, thus reducing the need for temporary access arrangements. Finally from a maintenance point of view do not include fragile roof lights. These are a source of many accidents and designers should be aware of this and make alternative provision.

The next priority is site access and transport. Designers should specify the layout of the site, buildings and any obstructions to transport. An illustration was shown first of a poor site layout where the area was cluttered and disorganised and there was no segregation between the site access and the public highway creating a very high risk of accident and injury. Several other obvious hazards were visible. This was contrasted with another site where the layout had obviously been pre-planned and the plan adhered to. It looked well managed and the hazards seen on the previous illustration had been removed. There was better access to the site from the public highway, and the need for vehicles to reverse had been minimised by introducing a one way system. Other practices which reduce risks include the early grading of sites on slopes to remove hazardous gradients and embankments; also design access routes to avoid any overhead cable obstructions.

Another priority is to reduce the risk of musculoskeletal disorders. On construction sites the most common problem is backs. One way designers can reduce this risk is to avoid the use of heavy building blocks and lintels and reduce bag sizes (say of cement) so they weigh less and can be carried and handled without the risk of back injury. An alternative solution is to make units so large that they cannot be lifted without equipment. Kerb stones are an example where lifting aids can be useful. Kerbs are extremely heavy but traditionally were manhandled. An illustration was shown of lifting aids for kerbs which, although not popular at first, have proved very successful now the workers have got used to them. In short designers can Identify MSD risks – in the design/specification; avoid them where possible; specify low/very large unit weight to reduce risk; design for use of handling aids/ crane lifting points; liaise with mfrs/suppliers to reduce risk; and mark the design documents with product weights.

So far we have looked at safety issues but the designer can equally assist in reducing health risks. In the construction industry vibration white finger is one problem which designers can help with by eliminating the need for high vibration processes e.g. scabbling. This is not only a cause of vibration white finger but is also noisy and dusty. Similarly careful choice of materials can reduce exposure of workers to toxic substances. Most surface coatings will have a degree of toxicity but some are considerably less hazardous than others. Specifying the use of non-chrome cement will reduce the incidence of allergic dermatitis which is the main reason experienced bricklayers are lost to the industry.

Looking at an overview of design good practice the following provides a simple guide:
• Manage construction risk through structured hazard identification and by eliminating and reducing risks to people throughout the life-cycle of the built environment;

• Take full account of the work processes - including temporary works and their design – during the whole life of initial construction, ongoing use, maintenance and subsequent decommissioning;

• Take full account of the risks that remain after hazard identification and elimination and, where these cannot be significantly reduced, provide clear information about them.

• Engage throughout the work so that on site and whole-life lessons can be learned for inclusion in future designs

• Review successes and failures at project closure so that lessons are learned and best practice embedded and shared

There are a number of sources of information a designer can turn to. There is the designer section on the construction part of the HSE website (www.hse.gov.uk) where there are ‘red/amber/green’ lists for processes and products; the Construction Design and Management Regulations Approved Code of Practice; CIRIA’s Publication ‘Safe Access for Maintenance and Repair, C611; and Designer Information Sheets.

Summing up she said the key messages to get across were:

• Eliminate – Reduce - Inform
• Early involvement of all parties is essential
• Provide clear information on residual risks;
• Engage and review throughout the project
• Review at project close the successes and failures and ensure you act on them i.e. lessons enter the corporate memory.

DESIGNING FOR RISK REDUCTION

Pam Waldron
Head of Operations
Health & Safety Executive

The proposition

• Designers are in a unique position to reduce the risks that arise during construction, use, maintenance, refurbishment and ultimately demolition

• Their decisions fundamentally affect the risks faced by workers and building users.
What we find

- Many (uninformed) designers show little interest in or understanding of the health and safety implications of construction their designs
- It works best (unsurprisingly) where health and safety is an integral part of the design process, not an after thought

Designers do not have to:

- take into account unforeseeable hazards
- exercise any health and safety management functions over contractors or other designers

Designers do have to:

- Eliminate hazards where feasible
- Reduce risks where hazards cannot be eliminated
- Provide information on residual risks if they are significant

Design good practice (1)

- Manage construction risk through structured hazard identification and by eliminating and reducing risks to people throughout the life-cycle of the built environment;

Priority areas

- work at height
- site access and transport
- manual handling
- noisy and dusty processes
- hand arm vibration
- cement dermatitis
- Slips and trips – housekeeping!

Maximise successes – working at height

- Fabrication at ground level
- Steel designed for early edge protection
- Steel designed for net attachment
- Early permanent access
- No fragile roof lights

Designers can specify:

- Layout of site, buildings etc and possible obstructions to traffic
- Early grading of the site to remove hazardous gradients and embankments
- Safe traffic routes avoiding hazards such as overhead cables
Designers can specify:
- temporary roads with safe road profiles
- early construction of roadways
- adequate room for safe traffic flow during construction incl one way systems to minimise reversing
- safe site access points in relation to the public highway

Maximise successes – musculoskeletal disorders
- No heavy bags
- No heavy building blocks, lintels etc
- Pre-fabrication

Designers can
- Identify MSD risks – in the design/specification
- Avoid them where possible
- Specify low/very large unit weight to reduce risk
- Design for use of handling aids/ crane lifting points
- Liaise with mfrs/suppliers to reduce risk
- Mark the design documents with product weights

Designers can
- Eliminate noisy/high vibration processes eg scabbling
- Specify less toxic surface coatings
- Specify non – chrome cement to reduce incidence of allergic dermatitis
- Eliminate hand levelling.

Design good practice (1)
- Manage construction risk through structured hazard identification and by eliminating and reducing risks to people throughout the life-cycle of the built environment;

Design good practice (2)
- Take full account of the work processes - including temporary works and their design – during the whole life of initial construction, ongoing use, maintenance and subsequent decommissioning;

Design good practice (3)
- Take full account of the risks that remain after hazard identification and elimination and, where these cannot be significantly reduced, provide clear information about them.

Design good practice (4)
- Engage throughout the work so that on site and whole-life lessons can be learned for inclusion in future designs
- Review successes and failures at project closure so that lessons are learned and best practice embedded and shared
Mr Greenhalgh opened by explaining his background and experience. He has 30 years experience in the Construction Industry, and is qualified as a Chartered Civil & Structural Engineer. He has extensive experience in the Design and Construction of major Construction Projects and has spent the last 20 years acting as the Employers Project Manager.

He explained that in preparation for his presentation he had checked with the HSE website for their definition of the role of the employer's project manager in H&S risk management.

He identified four main headings:

- **Leadership**
- **Working Together**
- **Quality to Match Life & Use**
- **Promote Respect for People (RfP)**

Taking each of these in turn he believed the first, leadership, could be demonstrated by establishing a safety culture which was understood by all those involved. Ensure a competent and experienced project team is deployed and that they buy into the ethos of safety. In the early stages of design think carefully about the potential hazards and then make sure they are addressed by ensuring effective health and safety controls are in place. Financial control is essential if health and safety is to be taken seriously. When undertaking discussions with the customer, off the cuff expressions like ‘too expensive’ and ‘can’t afford that’ puts the designer off and prevents a clear financial strategy from being established. The costs, including those allocated to safety must be discussed in an open way. The development of a clear programme management strategy and the establishment of effective stakeholder management are all key parts of effective leadership.

The next issue, working together, stems directly from the last item of the previous list. Stakeholder management will only be effective if all parties are clear about objectives,
targets and potential difficulties. Mr Greenhalgh said it was essential, before the project had got under way to pull all the stakeholders together, including those operating on site, those in the materials supply chain as well as the end user. In the end the aim is to set up a collaborative working scenario during the building phase between the various contractors and the supply teams promoting early supply chain involvement in CDM Risk and Value Management Workshops.

When looking at the third issue, ‘quality to match life and use’ it is obvious that requirements will differ between an iconic project, like the Spinnaker Tower at Portsmouth, and a project which is just a 5yr refurbishment of an existing building. The issues to be considered include matching the quality of the original build to match its anticipated life use. There is no point in using long term durable materials if cheaper but adequate materials are available for a temporary or short term structure. Minimise H&S risk to all those likely to use the building during its life and those who will be keeping the building in good order such as the maintenance staff. Maximise functionality to minimise unnecessary build, using sustainable materials wherever possible. Very important nowadays is to minimise the anticipated energy use of the building. ‘Green’ buildings are a good example. Obviously when building such projects there will be an additional cost to provide the benefit. For example solar heating, wind generated power, insulation, etc. One has to be open with the client and explain the costs and anticipated benefits for each ‘green’ standard.

Finally the ‘respect for people’ issue. This has changed over the last 5 to 10 years. Once upon a time no self-respecting person would want to work in poor conditions but this is exactly what you found on many construction sites. Nowadays on many sites conditions have improved considerably. To achieve the latter condition the project manager has to ensure all members of the clients project team agree to look after their staff to an agreed acceptable standard. He also has to ensure all contractors / sub-contractors provide good welfare facilities for all operatives both on and off the site. Make sure the contractor establishes strong H&S controls on site and lastly, ensure the designers provide a good H&S environment for future users of the building.

Turning now to the Spinnaker Tower project in particular, David Greenhalgh advised that the Tower was some 170 Metres high, a spectacular iconic building. It, together with its surroundings, had transformed this Portsmouth area from a previously run down naval town to a splendid maritime/leisure area.

The challenges the construction of such a tower presented included the unique design, where no previous experience of similar buildings was available. It was very high and the construction site was both constrained and adjacent to a busy shopping centre. Crane access was limited and in the construction of the reinforced concrete raft this immediately presented a lifting problem. The risks from manual handling of heavy reinforcing steel bars were mitigated by designing the bars so that where crane access was difficult no bar would exceed 50kg making it suitable for a two man lift and manoeuvre whereas where a crane could be used the bars were made so large that only mechanical lifting was possible and manual handling was impossible. In addition each bar over 50kg was marked with a prefix indicating that mechanical handling was to be used. Such a design meant that there was a cost increase but the benefits from an absence of lifting accidents far outweighed the additional cost.

The other obvious risk to tackle was falls, both people falling from height and materials falling from height onto people, particularly during the construction of the pair of concrete columns. Construction took the form of a slip form rig which climbed the structure as the building gained height. The principal mitigation measures to prevent falls during this phase included fully walling the main working areas of the Rig with plywood, installing fine catch
netting under the full extent of the Rig, fully enclosing the Rig with cover sheets, providing a fully enclosed access hoist for materials and people and finally providing a scaffold catch fan at the base. These measures were all discussed and agreed some four months before the rig came to site. Once construction of the columns began they progressed by 2 metres per working day for 5 months until a height of 135 metres had been reached. The risk of falls was also present during the painting and lighting operations and again, ways to mitigate the risk were discussed and agreed during the design when a specialist IRATA roped access company was made part of the design team. As a result a system of rope anchorage points were cast into the shaft and included in the steelwork during construction. Specialist access cradles were designed and installed where possible and specialist roped access personnel were used where cradles were impractical.

During construction of the viewing decks there was, in addition to falls from height, the additional hazard of manual handling of heavy glass sheets. These risks were addressed by providing a scaffold crash deck under the lowest view deck, providing a fully enclosed scaffold and sheeted enclosure to all the view decks and the deployment of a specialist mechanical suction handler for the glass.

Summing up, as a result of careful hazard analysis and risk management together with close working with the Health and Safety Executive, a safe and iconic building was constructed to a height of 170 metres with very few accidents on site. Design features have been included to enable all anticipated maintenance operations to be carried out safely.
The Clients Role in Risk Management at the Spinnaker Tower

Working Together
- Choice of a “collaborative” form of contract (NEC etc.)
- Promote an integrated team approach to all issues
- Promote integrated working in workshop style environments
- Promote early supply chain involvement in CDM Risk and Value Management Workshops

The Clients Role in Risk Management at the Spinnaker Tower

Respect for People (RfP)
- Ensure all members of the Clients Project Team agree to look after their Staff to an agreed acceptable standard.
- Ensure all Contractors / Sub-Contractors provide good welfare facilities for all operatives both on and off site
- Ensure the Contractor establishes strong H&S controls on site
- Ensure the Designers provide a safe H&S environment for future users of the Building

The Clients Role in Risk Management at the Spinnaker Tower

Height 170m - (Above Sea Level)
- 3 Viewing Decks 100m, 105m and 110m
- Emergency Staircase and External ‘Panoramic’ Lift
- Internal Express Lift
- Base Building with Coffee Shop

The Clients Role in Risk Management at the Spinnaker Tower

Quality to Match Life and Use
- Quality of original build to match the anticipated Life Use
- Minimise H&S Risk to all Building users and future maintenance staff
- Maximise functionality to minimise unnecessary build
- Maximise the use of sustainable materials
- Minimise the anticipated Energy use of the Building

The Clients Role in Risk Management at the Spinnaker Tower

A Brief Background on the Spinnaker Tower
- A Millennium Commission Project
- Redevelop Redundant MOD Land
- Regeneration of Portsmouth Harbour
- World Class Leisure & Maritime Destination
- Started Feb 2001 completed Oct 2005

The Clients Role in Risk Management at the Spinnaker Tower

What form of contract should we use?

独特类型
- 高层
- 限制性施工
- 相邻活跃购物中心
- 专业施工活动

The Clients Role in Risk Management at the Spinnaker Tower

RC Raft Construction

RISKS
- Manual Handling of Heavy Reinforcement

PRINCIPAL MITIGATION MEASURES
- Use of short Reinforcement Bars wherever possible to limit weight to a max of 50kg (2 man lift).
- Identification of every heavy bar over 50kg by a special prefix indicating mechanical handling.
- Accept increase in costs of materials

The Clients Role in Risk Management at the Spinnaker Tower

Concrete Shaft Construction – Slipform

RISKS
- Materials falling from Height
- People falling from Height

PRINCIPAL MITIGATION MEASURES
- Fully wall the main working areas of the Rig with plywood
- Install Fine Catch Netting under the full extent of the Rig
- Fully enclose the Rig with Cover Sheets
- Provide a fully enclosed access hovel for materials and people
- Provide a scaffold Catch Fan at base
INTEGRATING SAFETY INTO DESIGN

Mr Colin Smith, HSEQ Director, Balfour Beatty Construction

In his opening comments Mr Smith said that his work could perhaps be described as being at the better end of the market, close to the flatter end of the curve previously shown by Pam Waldron, where additional cost on the design did not give good returns in terms of safety. However, with a hint of humour, he said he was nervous of saying this because in his experience such comments had a habit of coming back and biting you. In his opinion he felt that the design risk assessment and pre-tender health and safety plan required by the construction design and management regulations (CDM) involved hundreds of man hours activity which was rarely of much help. He suggested that this time could be released and spent on more beneficial aspects of risk management. There was suggestion that the CDM Regulations together with the safety case limited innovation but this was not the case, 80% of the problems can be managed by 20% of the effort.

The trick is to use the process to advantage. Use it to target the key issues, to develop a project policy and to manage the issues identified throughout the process. One very important safety strategy is to sit down with all the different contractors in the team at the beginning of the project and discuss hand over issues. This reduces the chance of accidents occurring as a result of misunderstandings between different contractors.

The target areas that usually need addressing include the problems with working at height, ably described by Mr Greenhalgh, and it cannot be emphasised strongly enough that decisions on mitigating measures need to be taken at the beginning of the project at the design stage and not half way through as an afterthought. For example if a hole has to be present in structural steel say don’t make it necessary for someone to climb up and drill the hole but cast it in the first place. Similarly any temporary stability issues have to be explored and the policy for tackling it decided before the construction phase starts. Provision and installation of cables and other services can and often do result in a nasty environment during installation, cables and people just do not mix safely. Two examples were shown, one of an all too often scenario where men on ladders were installing cables using temporary lighting and with debris scattered about the floor. The other showed a pre-constructed unit which included all the services eliminating the need for them to be fitted.
retrospectively. Taking the idea a stage further another slide was shown where a complete bathroom pod had been prefabricated with the plumbing and cabling pre installed.

Traffic and transport also presents a high accident risk. It is essential to plan the site carefully to make sure roads and drains provide good access, reduce the risk of water logging and allow plenty of room for storage. A slide was shown comparing such a site with one where the site was very untidy and therefore dangerous. Two other frequent hazards found on construction sites were vibration and manual handling. Again risks from both these hazards can be reduced by careful design as illustrated earlier by Mr Greenhalgh. Another potential hazard is the application of external cladding. To mitigate this risk design the cladding so that it is easy to install thus allowing it to be fitted from a scissor lift rather than from scaffolding. This eliminates the need, cost and attendant hazards of scaffold erection and dismantling. One such design of cladding was illustrated.

Yet another example of risk reduction was illustrated by investing in temporary works to provide safe storage of structural steel. One illustration showed a water logged access route to the storage while the other showed a concrete raft laid to provide a stable foundation for storage and safe access.

When working at height edge protection must be provided to prevent falls. However some edge protection designs were useless, as illustrated on the left of his next slide, whereas the design on the right not only provided protection during construction but would provide safe access over the next 20 years or so, when maintenance was necessary.

Always remember that designers can not only influence safe practice but can also aid productivity. The safety gain provided by the edge protection shown on the left of the penultimate slide was lost by the time spent doing the edge casting.

In conclusion let us look at the objectives of integrating safety into design. First remember good solutions often impact on several issues; safety is compatible with efficiency, programme and quality; take an integrated holistic approach from the outset; and finally be creative and exciting not just about how it looks but also about how it goes together and is used.
Barriers

- Lack of understanding
- Design Risk Assessment & Pre tender H&S Plan
- Restriction of innovation and creativity

Using the Process to advantage

- Target key issues
- Develop a Project Policy
- Manage the issues right through the process

Target Areas

- Working at Height
- Temporary Stability
- Cables and Services
- Traffic and Transport
- Vibration
- Manual Handling

Traffic

Services

Bathroom Pods

External Cladding

Structural Steel
The Chairman thanked the speakers for their well illustrated presentations and then invited questions from the floor.

The first questioner asked how you ensure a design is 'fit for purpose'. In response it was suggested that a similar phrase ‘fulfils functionality’ should be avoided as functionality is more prescriptive and would require greater degrees of definition. ‘Fit for purpose’ was a legally accepted phrase and designers can address it by taking a journey through the life of the building from Design concept, build, use, maintenance, refurbishment and eventual demolition. If each of the phases are looked at in turn against the design and at no stage does the role of the building appear too dangerous or the cost of safety is not too great then the design is fit for purpose. However if this is not the case then don’t build it. Architects find it difficult to appreciate the limitations of construction techniques. The structure or concept that the architect designs must be buildable and the client is responsible for build safety.

Reference was made to the external glass lift on the Spinnaker Tower which had so publicly broken down on the day of opening. Was this lift fit for purpose? It was held that the lift had been originally designed for maintenance and a second line of access for firefighters and as such was fit for purpose. The problems encountered had been due to the exceptional high winds that are experienced at that position on the quayside and the several safety systems fitted to the lift. As a result of a combination of these the lift had suffered reliability problems which were now being addressed. External lifts were usually inclined lifts and the lift on the
Spinnaker Tower was a unique design. Initial problems with reliability are not unusual with unique systems because of the lack of experience to base designs upon.

Another questioner referred to the fact that for most cases in engineering there were a limited number of key areas to address for safety purposes and a finite number of remedies which set the guidelines. Are there such guidelines for building designers and who will or has produced them? In answer it was stated that the HSE web site www.hse.gov.uk/Construction Industry/Designers gave, via a link, access to design sheets. While these sheets probably needed refreshing they were nevertheless a good source of information for designers. An approved code of practice supported by guidance would be the ideal but not yet available. There was guidance available on a range of design issues from CIRIA. The main point to take away is that even with all the guidance available leadership is the essential success ingredient. Every aspect of the built environment requires competent leaders. Regrettably there is some evidence that rather than lead, most hide behind others and the Millennium Dome provides a good example of this.

Colin Smith’s assertion that the many hours spent on the design risk assessment and pre-tender health and safety could be better spent elsewhere was refuted. There was, particularly with complex systems, a very real need for the paperwork to be available. However, the paperwork should be limited to that which serves a useful purpose and not be filled out with superfluous material.

What scope was there for computer modelling? Is this the future opportunity? Computer modelling undoubtedly has a place in design but the models should be used with caution. There is a danger that we might lose the understanding if blindly relying on the results of a model.

Is incentivisation a good or bad idea? In other words could there be incentives for achieving low accident rates. It was thought that this was not good because it may lead to reduced reporting of incidents and accidents. The Corporate Manslaughter issue was raised. In reply it was held that if the Company ethos is good safety practice then Corporate Manslaughter is unlikely to be an issue. As stated earlier, however, there has to be evidence of good leadership.

In summing up the Chairman stated that Safety cannot be bolted on at a later stage it must be included in the original design which should be intrinsically safe. There had to be a balance between legislation and construction. Good quality guidance for all those involved was to be encouraged but if there was an excess of guidance this could be just taken down off the shelf and used in the project plan. This could be harmful as it might reduce the understanding necessary to design buildings safely. It was important that each plan was project specific.

At the end of the day the prime aim is that colleagues go home in the same condition as they set out that morning!

Finally he thanked again the Institution of Mechanical Engineers and The Health and Safety Executive whose joint sponsorship enabled the event to take place.